MACHINE FOR COFFEE BEVERAGE PRODUCTION

DESCRIPTION

The present invention relates to a machine for producing a coffee beverage.

Traditional machines comprise a device to contain the coffee powder and the water supply device united in a single unit that also forms the coffee powder infusion chamber; moreover, said machines also include a dosing device for the coffee powder, a moving action mechanism, a boiler, etc.

In said machines, the container - supply device is removable, for example, for cleaning or maintenance purposes; in fact the container - supply device is the part that is most often soiled because it is always in contact with the coffee powder and because the infusion operation occurs inside this device.

However, washing of this device is extremely difficult, and in certain cases, can also be damaging for the machine.

In fact, it is very complicated to obtain access to the internal parts of the container - supply device, and this hinders the correct and complete cleaning operations, especially of the filter.

Moreover, since the container - supply device includes parts that are in relative motion, it is possible that the lubricant is removed, or that certain components are removed or displaced from their correct position during washing operations; the consequences are easy to imagine, both in terms of possible machine damage and in terms of

unsatisfactory coffee quality.

A further problem with traditional machines concerns the fact that the machine will produce good quality coffee only when the intervals between one coffee production operation and the next are very short.

In the machine for the production of a coffee beverage (in particular domestic versions) that are used with average frequency, the time lapse between the preparation of one cup of coffee and the next is generally too long to guarantee that the internal machine parts, and in particular the water pipes, are still hot; and therefore the quality of the coffee produced by the machine is limited.

Therefore the technical task proposed by the present invention is to realise a machine to produce a coffee beverage that will eliminate the technical problems known in prior art.

Within the context of this technical task, one purpose of the invention is to realise a machine that can be washed easily and without the risk of damaging the components.

Another purpose of the invention is to realise a machine equipped with parts that are all easily accessible.

In particular, the internal portions of the component adapted to contain the coffee powder, always particularly exposed to soiling risk even when separated from the machine, are easily accessible according to this finding: this permits the maximum possibility of rapid complete cleaning operations, especially the filter component.

A further purpose of the invention is to realise a machine that can be washed without the accidental removal or displacement of consumer elements or parts such as the mechanism lubricant.

The last but by no means the least purpose of this invention is to realise a machine that produces a coffee beverage that is sufficiently hot even when the machine is not in constant use with long intervals between one coffee production and the next.

The technical task, as well as these and other purposes, according to the present invention are attained with the realisation of a machine for producing a coffee beverage according to the appended claims.

Further characteristics and advantages of this invention will be made clearer with the description of a preferred but not exclusive embodiment of the machine according to the finding, illustrated in an indicative but not limitative manner in the appended drawings wherein:

- figure 1 shows a schematic view of the machine according to the invention;
- figures 2 and 3 show a cross-section of the container device in two different configurations;
- figure 4 shows a view in perspective of the coffee powder container device;
- figure 5 shows a lengthwise cross-section of a moving mechanism device according to this invention;
- figure 6 shows a schematic cross-section of a portion of

the machine in an idle configuration, wherein it is possible to extract the coffee powder container device;

- figure 7 shows a schematic cross-section of a portion of the machine in a configuration during the coffee powder supply action;

- figure 8 shows a schematic cross-section of a portion of the machine during an operational stage;

- figure 9 shows a schematic cross-section of a portion of the machine in a configuration with the coffee container device connected to the fluid supply device so that it forms the infusion chamber;

- figures 10, 11, and 12 show a schematic cross-section of a portion of the machine in configurations wherein the coffee powder container is successively positioned further away from the fluid supply device;

- figure 13 shows a schematic cross-section of a portion of the machine in a configuration wherein the waste coffee powder is expelled from the container device;

- figure 14 shows a schematic cross-section of a portion of the machine during a return stage in idle configuration after the expulsion of the waste coffee powder;

- Figures 15-18 show a schematic cross-section of a tap on the machine that delivers liquid or steam in four different function configurations;

Figures 19, 20, and 21 show a schematic section of a system for connecting the coffee container device to the machine. In particular, figure 19 illustrates the coffee

container device separate from the machine, while figure 20 illustrates the coffee container incorrectly or only partially connected to the machine so that the micro-switches will not enable the machine to produce the coffee beverage, and lastly figure 21 illustrates the position of the coffee container device when it is connected to the machine correctly, so that the microswitch will transmit the consent to the machine to produce the coffee beverage.

In reference to the aforesaid figures, the machine for producing a coffee beverage is indicated throughout with the reference numeral 1.

The machine 1 comprises a coffee powder container device 2 and a fluid supply device 3 for producing the coffee beverage, where both devices are reciprocally mobile so that when they are connected together they form a coffee powder infusion chamber 4.

Advantageously, the container device 2 is removable from the machine 1, so that it can be separated.

In particular, as shown in the appended figures, the container device 2 is connected to a pivoting device 2a adapted to move the container device 2 from a position a certain distance from the supply device 3 to a position adherent to supply device 3.

The container device 2 presents first and second means of connection 5,6, to the pivoting device 2a, where the first means of connection 5 comprises at least one rotation pin 7 for container device 2 insertion, and the second means of

connection 6, comprises couplings 8 for connection to a slide 9 of the pivoting device 2a which is mobile in relation to pin 7.

The figure shows that slide 9 presents seatings 10 for connection to couplings 8.

The rotation pin 7 is preferably fixed and positioned lower than slide 9.

Slide 9 is connected through a sliding action to a guide 11 which controls at least the angular motion of container device 2 around pin7; in addition, slide 9 is also connected through a sliding action to a driving action screw 12 that is rotated by an electric motor 13.

Basically motor 13 controls the rotating action of screw 12, and in cooperation with guide 11, said screw prevents slide 9 from rotating together with the screw, causing translation of the slide along the screw 12 and rotation of the container device 2 around the pin 7 controlled by the profile of the guide 11.

As shown in the appended figures the container device 2 comprises at least three telescopic elements 15, 16, 18 that are connected to each other in sliding mode.

A first telescopic element is set on the rotation pin 7, a second telescopic element 16 is connected by sliding on the first telescopic element, and a third telescopic element 18 is connected by sliding on the second telescopic element 16 and adapted to house at least one portion of the supply device 3 to form the infusion chamber 4.

Advantageously, the second telescopic element 16 presents first abutments 19 adapted to act with second elastic abutments 20 of the first telescopic element 15, where, during the extension stage of the container device 2, the first and second abutments 19, 20, are adapted to control the translation action firstly of the third telescopic element 18 in relation to the first and second telescopic elements 15, 16, and during the retraction stage of the container device, they are adapted to control the translation, firstly of the second and third telescopic elements 16, 18 in relation to the first telescopic element 15, and then the translation of the third telescopic element 18 in relation to the second telescopic element 16.

Moreover, the machine comprises a means of expulsion 22 for the waste coffee powder from the container device 2.

The means of expulsion comprises, for example, an expeller lever connected to a double helix with pinion controlled rotation action.

In this manner the expeller lever is continually guided during coffee powder expulsion, limiting the danger of the powder blocking the mechanism and preventing correct machine function.

Advantageously, according to the present invention, machine 1 comprises an expansion chamber, identified by reference numeral 60, that presents a flattened configuration having a basically truncated cone shape, interposed between a water tank 61 and the container and supply devices 2 and 3.

The coffee powder container device 2 that can be separated from machine 1, for example for washing purposes, presents a blocking element adapted to maintain all the organs that compose the unit in correct position.

As is shown in particular in figure 2, the blocking element comprises a lever 51 hinged at point 50 to the first telescopic element 16; lever 51 presents a protruding portion 52 inside a tubular portion 53 adapted to house pin 7.

Lever 51 presents a right-angled end 54 that is inserted into the aligned holes 55 of the second and third telescopic elements 16, 18 to prevent said elements from extending when the device 2 is disconnected from the machine.

When device 2 is connected to the machine 1, the pin 7 rotates the lever 51 around the hinge 50 countering a spring action and causing the extraction of the end angle 54 from the aligned holes 55, permitting the extension of the tubular elements 15,16,18.

As shown in figures 19, 20, and 21, mobile hooking teeth 101 can be foreseen for reciprocal approach and outward motion by means of a spring 102, in order to connect the container device 2 to the machine 1.

When the container device 2 is connected in the optimal manner to machine 1, the teeth 101 are inserted correctly into the holes 105 permitting the correct closure of the hatch 106, and consequently through a pin 107 to trigger a microswitch 108 that provides the consent to machine 1 to produce the coffee beverage.

However after the elements have been disassembled, for example for washing purposes, if they are not re-assembled correctly by the user because the teeth 101 are partially, and/or incorrectly or not at all inserted in the holes 105, the hatch 106 will not close correctly because of the enlargement 110 of the teeth 101 and the pin 107 will not trigger the microswitch 108, thus preventing all machine function.

Advantageously, the machine according to this finding comprises a water or steam interception tap 25; in particular tap 25 is adapted to intercept the water or steam that exits from the machine, and is positioned upstream of the container and supply devices 2 and 3.

It is especially practical that when tap 25 is turned to one of its configurations, it is adapted to activate or deactivate one or more of the microswitches (not shown in the appended drawings for clarity) that control the switch-on or switch-off of the water supply pump to the boiler, and/or the switch-on or switch-off of the electric resistors/elements in the boiler.

Tap 25 presents a body 26 having at least a first and a second communicating space 27, 28, with the exterior, and is equipped with a piston connected internally in sliding mode.

Together with body 26, the piston 29 forms at least four chambers 30, 31, 32, 33, which can deliver water or steam alternatively.

Three chambers 30, 31, and 32 are formed by grooves

realised on piston 29 and a fourth chamber 33 has a variable volume and is formed between the crown of the hollow body 26 and the crown of piston 29.

Advantageously, a first chamber 30 of the said four chambers is connected to a duct 30a that opens onto the crown of piston 29, a second chamber 31 is closed, a third chamber 32 is connected to a duct 32a that opens onto the exterior of tap 25, and the fourth chamber 33 is connected to the space 28 of the water or steam supply on exit from the machine.

Moreover, in a preferred embodiment, the first space 27, (used for access to water or steam inside the tap 25) is realised on a side portion of the body 26, and the second space 28 (used for water or steam discharge from tap 25) is realised on the crown of the hollow body 26.

The function of the machine for producing coffee beverages according to this invention is obvious from the descriptions and illustrations, and in particular, is basically composed as follows.

The tap 25 is initially positioned in the configuration shown in figure 15, with chamber 31 that is closed, in communication with fluid entry space 27; in this configuration the pumps and the boiler resistors/elements are deactivated; no fluid can enter the interior of the tap 25, and therefore exit from the machine 1.

Two examples are shown in figures 16 and 17 to demonstrate how the boiler (not shown) feeds the tap 25 with steam.

Figure 16 shows the boiler pre-heating configuration where

space 27 communicates with chamber 32 which in turn communicates with a duct that opens outside the tap; the boiler supply pump is switched off while the boiler resistors/elements collaborate with a temperature sensor to control the temperature in the boiler to produce steam.

In this configuration the forming of any possible pressure in the boiler is prevented during the pre-heating stage because the steam is discharged into an expansion chamber.

However figure 17, represents the configuration where steam is used.

In this configuration, space 27 communicates with the variable volume chamber 33 because the piston 29 is positioned at the maximum distance from the crown of the hollow body 26.

So the steam crosses space 27 and enters chamber 33 and is sent for use through space 28.

In this configuration the boiler pump and resistors/elements are activated to send water into the boiler (which is set at the temperature attained during the pre-heating stage), the water turns to steam, and the steam is supplied to the user.

Figure 18 show the configuration in which tap 25 supplies the water to machine 1.

In this case space 27 communicates with chamber 30, which in turn is connected to a duct that opens onto the crown of piston 29.

Therefore the water crosses the duct and is sent for use

through space 28.

In this configuration the boiler pump and resistors/elements are activated to send the water into the boiler (which was brought under thermostat control in a transitory stage to the suitable temperature to produce hot water); the water is then sent to the user.

When the tap supplies water to the fluid supply device 3, the coffee beverage can be produced.

Figure 6 schematically shows the machine in idle position.

When the command is sent to produce a coffee beverage, the motion device 2a motor 13 activates the rotation of screw 12, and aided by the nut screw, it causes the translation of slide 9 along the same screw 12, and the rotation of the container unit 2 around pin 7.

Figure 7 shows a stage in which element 18 of the container device 2 is extended (to its maximum length because its abutments 36 are in contact with the corresponding abutments of element 16) to form a space to contain the coffee powder.

A coffee powder dosing device, indicated schematically with reference numeral 35, inserts a pre-established quantity of coffee powder inside this space.

At this point, because of the gradual extension, the elastic abutments 20 move past the abutments 19 of element 16 (as shown in figure 8) and element 16 begins extension until a portion of the fluid container device 3 is inserted into element 18 forming the infusion chamber inside which the

coffee powder is compressed (as shown in figure 9).

Element 18 presses on a lower portion 3a of device 3 and triggers a microswitch 37 that arrests the motion and provides the command for water supply into the infusion chamber, aided by abutment 38.

As is shown in particular in figures 8 and 9, before the container device 2 is connected to the supply container 3 (and in particular to the lower portion 3a) portion 3a is in a position at a certain distance from upper portion 3b of device 3.

When the container device 2 is connected to the supply device 3 it presses the lower portion 3a towards the upper portion 3b (as shown in figure 9) approaching them and activating microswitch 37.

Microswitch 37 commands the water supply to the infusion chamber and the production of the coffee beverage which is supplied to the user through valve 40 positioned on the space on element 16.

Following this, the coffee powder container device returns to idle configuration, first sending element 16 back onto element 15 and maintaining element 18 extended (until the abutments 20 are aligned with abutments 19, but have not yet passed them); element 18 returns onto element 16 bringing its abutments 41 onto the corresponding abutments of element 16, and in this manner causing the elastic abutments 20 to pass over the abutments 19 and to move further on (figure 12).

At this point, as shown in figure 13, the expulsion means

22, for example composed of an expelling lever, expel the waste coffee powder in the form of a single compressed tablet.

The coffee powder tablets are collected in a practical manner in a container 42.

Last of all, the coffee powder container device is then partially extended returning to idle position with the abutments 20 opposite but above abutments 19 (as shown in figure 14).

In a particularly advantageous embodiment, machine 1 comprises safety means adapted to interrupt machine function in the case of any faulty conditions, especially in the connection between the third tubular element 18 and the lower portion 3a of the fluid supply device 3.

In particular, the safety means comprise a position detector (not shown) adapted to detect the position of the third telescopic element 18 connected to an electronic control processor.

In the case of faulty machine function due to incorrect alignment between element 18 and portion 3a of device 3, for example, or the presence of coffee powder in the mechanical parts, or similar conditions, the electronic processor prevents the triggering of the microswitch 37 that commands the water supply to the infusion chamber until element 18 has been replaced in its correct position.

With this system, the microswitch 37 cannot be triggered until the connection between element 18 and portion 3a of

device 3 is not performed correctly (with element 18 at least in a position of a certain quota and device 3 that can activate the microswitch 37.)

Moreover, after a certain time lapse following the connection between element 18 and portion 3a, the electronic processor will cut off the action of motion mechanism 2a.

In this way, if the microswitch or some other component is damaged, this system will prevent any further damage to the machine 1.

In addition, advantageously, acting together with the electronic processor, the detector is adapted to command the arrest of element 18 in a pre-established position in relation to the dosing device 35.

When it is necessary to remove the coffee powder container device 2 from machine 1, first the hook-up couplings 8 must be released from their seats on the slide, and element 18 must be slid off pin 7.

This way, the coffee powder container device can be washed very easily because it does not involve moving the whole machine, and all parts are easily accessible, above all the filter.

The present invention also relates to a machine for producing a coffee beverage wherein the fluid supply device 3 is connected to the boiler 46 so that the heat dispersed by the boiler 46 heats the fluid supply device 3.

In particular, in the example shown in the appended figures, boiler 46 is located above the supply device 36.

Moreover, above the boiler 46, machine 1 is provided with a metal plate (preferably aluminium) adapted to absorb the dispersed heat from the boiler so that it remains hot and acts as a support for keeping cups warm.

The present finding also relates to a heating method for a machine that produces coffee beverages.

The method consists of heating at least the supply device 3 with the heat dispersed from the boiler 46 of machine 1.

It is particularly practical that boiler 46 and the supply device 3 are in contact with each other since the heat is transmitted by means of conduction in a manner to guarantee correct heating of supply device 3.

Moreover, at least one portion of the container device 2 is automatically connected to the supply device 3 while the machine 1 is idle, so that container device 2 is also heated by the boiler 46.

Another practical aspect is the fact that the container device 2 is automatically connected to the supply device 3 after a pre-established time lapse following the preparation of the last previous coffee beverage.

It has been demonstrated how the machine for producing coffee beverages according to the present invention results as particularly advantageous in that it can be washed very easily without risk of damage to the machine and without the need to handle heavy and cumbersome components.

The machine for producing coffee beverages conceived in this manner may be subject to numerous modifications and

variants, all of which remain within the context of the present invention; moreover, all components can be replaced with elements that are technically equivalent.